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Durham Region

Coastal Wetlands

Monitoring
a Changing Environment





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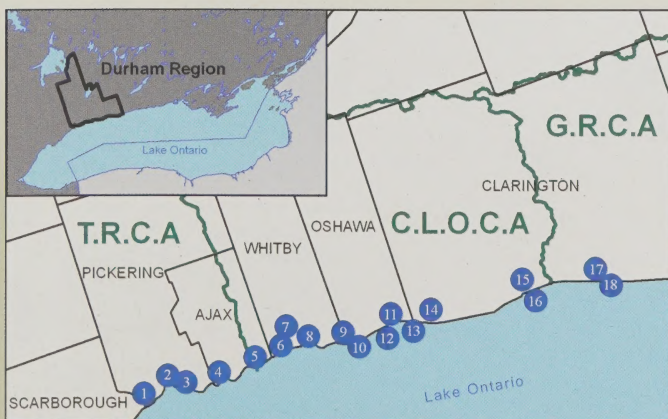
Durham Region Coastal Wetlands

Monitoring a Changing Environment

Durham Region supports a richness of wetlands along the shore of Lake Ontario. These wetlands are invaluable because they provide functions such as water purification and services in the form of wildlife habitat and recreational opportunities to the region.

Despite the vital importance of wetlands in this region, human-induced stressors including watershed urbanization and Lake Ontario water-level regulation are taking their toll. Initial assessments of the wetlands in 2002 and 2003 under the Durham Region Coastal Wetland Monitoring Project (DRCWMP) indicated that many of the wildlife communities and their habitats were in poor condition. Continued monitoring through 2009 suggests that the condition of Durham Region wetlands is generally in decline.

If the decline of the Durham Region wetlands is left unchecked, their future is grim. However, regional wetlands that have undergone restoration have shown improvement, and this leads specialists to believe that conservation actions within the wetlands and watersheds will make a difference.



General locations of wetlands being studied under the Durham Region Coastal Wetland Monitoring Project.

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Great Lakes Coastal Wetlands: A Primer

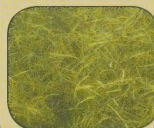
Wetlands are biologically rich and productive ecosystems that provide essential ecological and societal services (see also on page 4, **Who Needs Wetlands?**). They may be seasonally or permanently covered by shallow water, and also occur where the water table is close to or at the soil surface. The presence of water causes the formation of hydric (water-logged) soils that support water-tolerant plant species.

Great Lakes coastal wetlands are formed at the mouths of streams and rivers and in bays along the shoreline. They are located in the transitional zone between the upland area and the deeper lake waters. Various plant communities are easily observed within these wetlands. They occur in different parts of the wetland depending largely on the area's particular hydrology (i.e., the timing and extent of flooding).

Great Lakes coastal wetlands are classified by their hydrogeomorphology, which refers to their formation on the landscape and the nature of their water source. The hydrogeomorphic types of Durham Region coastal wetlands are predominantly **barrier-beach lagoons** and **drowned river-mouths**.

Wetland plant communities can be divided into five categories:

FLOATING AND SUBMERGED



EMERGENT



WET MEADOW



SHRUB THICKET



TREED SWAMP



Barrier-beach lagoons are bays that have sandy or cobble barriers at their mouths. The barrier is dynamic—it blows out when water levels in the wetland rise above the lake and closes when waves from the lake push the sand or cobble back across the mouth of the bay. The frequency of the opening and closing varies greatly among sites. As the barrier blows out and closes, water levels fluctuate in the wetland. These fluctuations can affect the amount and diversity of different wildlife habitats in the wetlands.

Drowned river-mouth wetlands form where tributary rivers or streams enter the lake, representing a zone of transition from stream to lake. They are characterized by meandering stream channels that are flooded when lake levels are high.



Wetlands are also classified by their predominant communities. Durham Region coastal wetlands consist of two main wetland types—**marshes** and **swamps**—although some remnant **fen** is present at Westside Marsh.

Swamps are wetlands dominated by trees and shrubs, with periodic standing water, limited drainage, and often neutral or slightly acidic organic soils.

Marshes are wetlands that are almost always flooded and characterized by a mixture of emergent, floating, and submerged aquatic vegetation such as reeds, sedges, pondweeds, and water lilies.

Fens are peat-accumulating wetlands with groundwater as the dominant water source. They support a variety of plant species including orchids, sedges, and grasses.



Who Needs Wetlands?

- Over two-thirds of the fish species living in the Great Lakes depend on coastal wetlands for spawning or nursery habitat.
- All 13 species of frogs and toads found in the Great Lakes basin use coastal wetlands during the breeding season.
- Over 100 species of waterfowl and other migratory birds use coastal wetlands for food and shelter during migratory stopovers.
- Many species at risk of extinction, such as King Rail, Least Bittern, Spiny Softshell Turtle, and Spotted Gar, depend on wetlands for essential life-history stages.

Coastal wetlands perform unique functions:

- Intercept and slow or reduce the flow of watershed runoff before it enters the lake, thus reducing or trapping excess sediments and nutrients such as nitrogen and phosphorus, which wetland plants absorb and use for growth.
- Provide habitat for microbe and invertebrate species, establishing the foundation for a complex food web. These food sources, along with the wetland plants, support a wide variety of fish, reptile, amphibian, mammal, and bird species.

These natural wetland functions translate into important societal values:

- Opportunities for recreational activities including canoeing, fishing, hunting, wildlife viewing, and photography.
- Protection of shoreline properties from the destructive forces of erosion.
- Improvement of water quality for the millions of people in Canada and the United States who rely on the Great Lakes for their drinking water.



Most Lake Ontario coastal wetlands are classified as provincially significant under Ontario's Planning Act and are key components of natural heritage systems.

Threats to Lake Ontario Coastal Wetlands

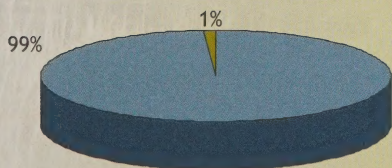
- Watershed land conversion to residential, agricultural and industrial uses
- Intensive farming practices
- Lake water-level regulation
- Pollution
- Climate change
- Exotic species

Conditions in coastal wetlands reflect the cumulative effects of land-use activities in the watershed. Substances released into watersheds affect conditions downstream in coastal wetlands. Upstream fertilizer application, road salt runoff, and erosion can adversely affect water quality. Often, the ability of light to penetrate the water is reduced. This affects aquatic wildlife as well as the growth of aquatic vegetation, which provides habitat for these wildlife species. Reduced water quality and habitat availability causes wetland functions to decline and their value to diminish. Wildlife sightings become less frequent, fish production decreases, and birds lose critical fledging and nesting habitat. Coastal wetlands are complex systems and resilient by nature; however, if human impacts are left unchecked, they could result in further wetland degradation which, beyond a critical point, may be irreversible.

Watershed Mapping

The mapping of watershed land cover makes it possible to evaluate the substantial impact of watershed-based activities on coastal wetland health. By mapping Durham Region watersheds and wetlands we have found:

- Vegetation is largely human-influenced and on successional lands (e.g., cultural meadows, thickets).
- There remains little native natural cover.
- Urban land cover dominates in some watersheds.
- No watersheds meet the recommended forest cover guideline of a minimum of 30% coverage.
- Three watersheds meet the minimum recommended guideline for inland wetland coverage (Cranberry, Pumphouse and McLaughlin Bay marshes) (greater than 10%).



- Total watershed area in Durham Region
- Total coastal wetland area in Durham Region

Coastal wetlands are the “end-of-pipe” environment for watersheds emptying into the Great Lakes. Activities in the watersheds affect the condition of the coastal wetlands. Imagine all the residential, rural, industrial and agricultural activities taking place in Durham Region watersheds (blue) and their effect on the area occupied by coastal wetlands (green).





Monitoring Is Key

Because wildlife communities and their habitats have been monitored, we know that wetland functions and values have been impacted in Durham Region coastal wetlands. Monitoring is the systematic inventory, evaluation and assessment of key components of an ecosystem. It allows for more than just documenting the demise of the Durham Region coastal wetlands. The monitoring results can be used to determine what aspects of wetland wildlife and habitat have been most affected. Following this analysis, specific conservation measures can be implemented to mitigate the impacts. Additional monitoring can then be conducted to determine the effectiveness of the conservation efforts and to guide whatever further action is necessary.

Using indicators to assess their condition, 15 wetlands have been monitored under the Durham Region Coastal Wetland Monitoring Project (DRCWMP) since 2002 and an additional three since 2007. The project was designed to improve coordination among concerned agencies using standardized monitoring methods. Partnerships among Environment Canada - Canadian Wildlife Service, Central Lake Ontario Conservation Authority, Toronto and Region Conservation Authority, Ganaraska Region Conservation Authority, Bird Studies Canada, and volunteers have ensured that monitoring results are comparable among sites. The ongoing monitoring in Durham Region is helping to lead and shape wetland monitoring throughout the Great Lakes.





Durham as a Monitoring Model

Implementation of the same monitoring protocols in other coastal wetlands in Lake Ontario, such as the Bay of Quinte, has allowed for comparisons of wetland conditions with other regions. While this project focuses on regional implementation, it also has direct relevance to other monitoring initiatives across the Great Lakes. The Great Lakes Coastal Wetlands Consortium (GLCWC), a binational, multi-partner initiative, developed the *Great Lakes Coastal Wetlands Monitoring Plan*, an implementation plan and monitoring framework for coastal wetlands at the Great Lakes basin-wide level. Collaboration between the DRCWMP and the GLCWC has resulted in reciprocal benefits to each group in harmonizing monitoring protocols in the Great Lakes.

Benefits of the Durham Region Coastal Wetland Monitoring Project

- Scientifically defensible, regional monitoring framework for evaluating the status and trends of coastal wetland conditions.
- Uses ecosystem approaches to monitoring.
- Time- and cost-effective methods that can be readily and easily implemented and expanded to include other sites.
- Detects changes in the environment that serve as early warnings to help prevent further wetland degradation.
- While designed for regional implementation, has direct application to coastal wetland monitoring basin-wide.
- Helps identify priority coastal wetland sites for restoration and/or protection initiatives.
- Allows for comparisons with other Lake Ontario coastal wetlands to help identify realistic and attainable restoration targets.
- Quantifiable measures of success by providing well-defined targets—as in the Bay of Quinte Area of Concern.



Monitoring Activities and Key Indicators

Note: Words in bold are defined on the following page.

	Monitoring Activity	Indicators of High Quality Ecosystem
Physical Features	Water quality	Low levels of dissolved nutrients such as nitrogen and phosphorus. Low turbidity , temperature, conductivity , and pH.
	Sediment quality	Low concentrations of heavy metals , PAHs , pesticides, and PCBs .
	Watershed and adjacent uplands land use	High percent natural cover—mainly forests and wetlands.
Biological Communities	Submerged aquatic vegetation	High species richness of native and turbidity-intolerant plants. High overall percent cover of turbidity-intolerant species. Presence of rare and specialized species.
	Aquatic macroinvertebrates	High numbers of mayflies and caddisflies. High number of taxonomic families . Relatively high abundance of crustaceans, molluscs, and caddisflies, but low abundance of midge larvae.
	Fish	High native species richness, particularly sunfish species. High abundance of native fish. High biomass of piscivores and Yellow Perch. Low biomass of non-native fish.
	Breeding amphibians (frogs and toads only)	High species richness—especially woodland species : Chorus Frog, Gray Treefrog, Spring Peeper, and Wood Frog. Woodland species present in several locations throughout the wetland.
	Breeding birds	High richness of area-sensitive species. High abundance of marsh-nesting obligates and non-aerial foragers .



What Is *Biological Community Condition*?

Throughout this document, biological communities in the Durham Region coastal wetlands are described in terms of their condition. Communities that have a prevalence of Indicators of High Quality Ecosystem (see table above) are in better condition than those for which the indicators are less prevalent.



TURBIDITY

Cloudiness of water due to suspended particles (e.g., sediment) or organic matter (e.g., phytoplankton).

CONDUCTIVITY

Measure of dissolved ions, often salts, in the water. Increases as urban runoff with high ionic content (e.g., road salt, fertilizers) enters the water body.

HEAVY METALS

Metallic elements with high molecular weights; generally toxic to wildlife in low concentrations (e.g., mercury and lead). Often residual in the environment and can accumulate in biological tissues.

PAH

Polycyclic aromatic hydrocarbon. Chemicals formed during incomplete burning of coal, oil, gas, garbage, or other organic substances. In wildlife, PAHs reduce lifespan and reproductive ability and cause tumours.

PCB

Polychlorinated biphenyl. Group of human-made compounds for industrial use. Highly toxic to living organisms and bioaccumulates in tissues.

SPECIES RICHNESS

Total number of species in a particular area.

TAXONOMIC FAMILIES

Group of closely related species (e.g. ducks, geese and swans are all in the same taxonomic family).

PISCIVORES

Fish species with diets composed predominantly of fish.

WOODLAND SPECIES

Species of frogs whose primary habitat for adults is wooded areas (swamps or forests) as opposed to marsh.

Breeding Bird Guild

Definition

Area-sensitive

Require minimum area of suitable marsh habitat for breeding.

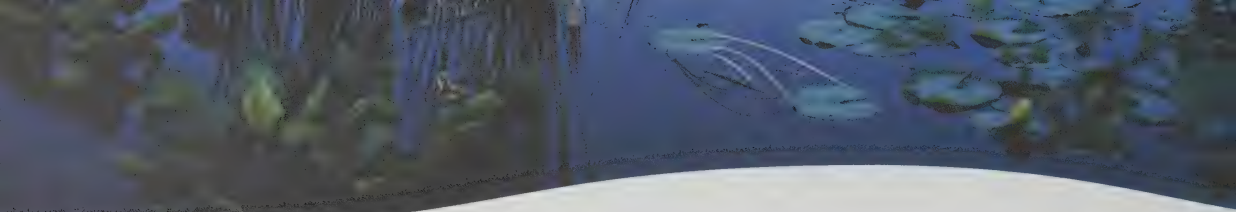
Marsh-nesting obligates

Nest exclusively in marshes.

Non-aerial foragers

Search for food in the open water and vegetated parts of the marsh, but generally do not feed on insects flying above the marsh.





How Were the Wetlands Ranked?

The conditions of the 18 wetlands were evaluated using quantitative measures and ranked using qualitative scales:

- poor
- fair
- good
- very good
- excellent

To evaluate the 18 wetlands in a broad context, additional Lake Ontario coastal wetlands outside of the Durham Region were monitored. Statistically calculated trends in condition are described as improving, deteriorating, mixed (annual rank varies with no clear trend), stable (the reported rank is generally constant), and unknown (insufficient data for analysis, i.e. three years or fewer). Trends are preliminary findings only, as monitoring has been conducted over a relatively short time period. Long-term, continued monitoring of Durham Region coastal wetlands is necessary to determine the strength of these initial results and to assess how the wetlands are changing over time in response to increased urban development and a changing landscape, as well as enabling the monitoring of restoration efforts. Further details of wetland indicators and analyses are provided in the DRCWMP Six-Year Technical Report.

www.cloca.com/lwc/monitoring_coastal.php



Durham Region Coastal Wetlands at a Glance



Report Card

	Condition	Trend*
Water quality	Generally fair Poor quality at Carruthers Creek Marsh, McLaughlin Bay Marsh, and Gold Point Marsh	Improvements at Bowmanville, Corbett Creek, Duffins Creek and Rouge River marshes
Sediment quality	Fair to excellent Poorer quality at inlets and tributaries than at outlets and locations within wetlands	No significant trends detected
Submerged aquatic vegetation (e.g., pondweeds, water lilies)	Generally poor to fair condition Good condition at Oshawa Second Marsh	Improvements at Duffins Creek and Rouge River marshes Decline at Bowmanville Marsh
Aquatic macroinvertebrates (e.g., mayfly, dragonfly nymphs)	Generally fair to good Poor condition at Hydro Marsh	Improvements at Corbett Creek, Cranberry and Westside marshes Decline at Wilmot Creek Marsh
Amphibians (i.e., frogs and toads)	Poor to good	No significant trends detected
Breeding birds	Poor to very good	No significant trends detected
Fish	Poor to good	Decline at McLaughlin Bay Marsh
Watershed land cover	Primarily urban or rural; vegetated land covers are dominated by culturally influenced communities such as orchards, crops and tree plantations	No significant trends detected but significant urbanization is expected
Adjacent land use and change	Lands in natural cover or agriculture have been developed for residential or non-residential (e.g., industrial, commercial) uses	Residential development increasing across Durham Region, except where zoning or conservation initiatives have limited available sites

* Trends are based on preliminary findings; continued monitoring is required.





Little or no detection of **indicator species** in many Durham Region coastal wetlands:

- No area-sensitive marsh-nesting obligate birds in 5 of 15 wetlands
- Few woodland amphibian species
- Few Yellow Perch and piscivorous species
- Low numbers of sensitive aquatic macroinvertebrates such as caddisflies and mayflies

Disturbance-tolerant species are common:

- Many non-native fish species
- High percentage of midge larvae



Better overall conditions at other Lake Ontario coastal wetlands (outside Durham Region):

- Better water quality
- Biological communities in better condition, especially submerged aquatic vegetation and amphibians
- Higher species richness and abundance in most communities studied
- Fewer non-native species in communities studied
- More indicator species:
 - Turbidity-intolerant submerged aquatic vegetation
 - Yellow Perch and piscivores
 - Woodland amphibians
 - Area-sensitive marsh-nesting obligate birds
 - Caddisflies and mayflies

Restoration efforts initiated at Duffins Creek, Rouge River and Cranberry marshes have contributed to significant improvements at these wetlands:

- Improved water quality and submerged aquatic vegetation community condition at Rouge River Marsh
- Improved water quality, submerged aquatic vegetation community condition and bird community condition at Duffins Creek Marsh
- Improved aquatic macroinvertebrate community condition at Cranberry Marsh



Indicator Species

Selected species of plants or animals whose presence and abundance can provide information on ecological change and give early warning signals regarding ecosystem processes due to their sensitive reactions to them.



WETLANDS IN FOCUS

No.	Wetland
1	Rouge River Marsh
2	Frenchman's Bay Marsh
3	Hydro Marsh
4	Duffins Creek Marsh
5	Carruthers Creek Marsh
6	Lynde Creek Marsh
7	Cranberry Marsh
8	Whitby Harbour Marsh
9	Corbett Creek Marsh
10	Gold Point Marsh
11	Pumphouse Marsh
12	Oshawa Creek Marsh
13	Oshawa Second Marsh
14	McLaughlin Bay Marsh
15	Westside Marsh
16	Bowmanville Marsh
17	Wilmot Creek Marsh
18	Port Newcastle Marsh

The 47-km² Rouge Park is mostly found in the Rouge River Marsh watershed and is 13 times the size of New York's Central Park.



Rouge River Marsh

The Rouge River Marsh has the largest watershed of all Durham Region coastal wetlands, with headwaters extending up to the hills of the Oak Ridges Moraine. Conditions in the marsh represent the cumulative effects of land-use activities over a large area. Following expressions of concern about watershed health, a multi-stakeholder task force developed the Rouge River Watershed Plan in 2007 to guide future land-use activities in the watershed.

Over many years, restoration efforts aimed at native vegetation have improved habitat conditions in the marsh. These efforts include planting native marsh and riparian vegetation, uprooting Purple Loosestrife, and constructing exclosures to keep out Common Carp and Canada Geese to allow the plants to become established. The installation of bird and bat boxes and construction of osprey nesting platforms and habitat structures have also contributed to improving habitat quality.

These restoration efforts have translated into significant improvements in conditions in the marsh. Both the submerged aquatic vegetation community and the water quality have improved over the study period. These trends are encouraging for the other biological communities in the marsh, which are currently exhibiting mixed trends. Amphibian species diversity was high in the marsh, but no woodland species were heard during two of the five study years. The presence of some rarely reported species in Durham Region coastal wetlands, including the Gray Treefrog and the only bullfrog recorded under the project, suggests that this marsh has the potential to support a variety of important wetland species. In 2007, the Rouge River Marsh had the best aquatic macroinvertebrate community observed in any of the wetlands being monitored.

Wetland Statistics

Location	Cities of Toronto and Pickering
Wetland type	Drowned river-mouth
Vegetation types	Marsh 64%, swamp 36%
Wetland size	56 hectares
Watershed size	33 289 hectares
Natural cover in watershed	24%

Report Card — Rouge River Marsh

	Condition	Trend
Water quality	Fair	Improving
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Fair	Improving
Aquatic macroinvertebrates	Good	Mixed
Amphibians	Fair	Mixed
Birds	Good	Mixed
Fish	Fair	Mixed

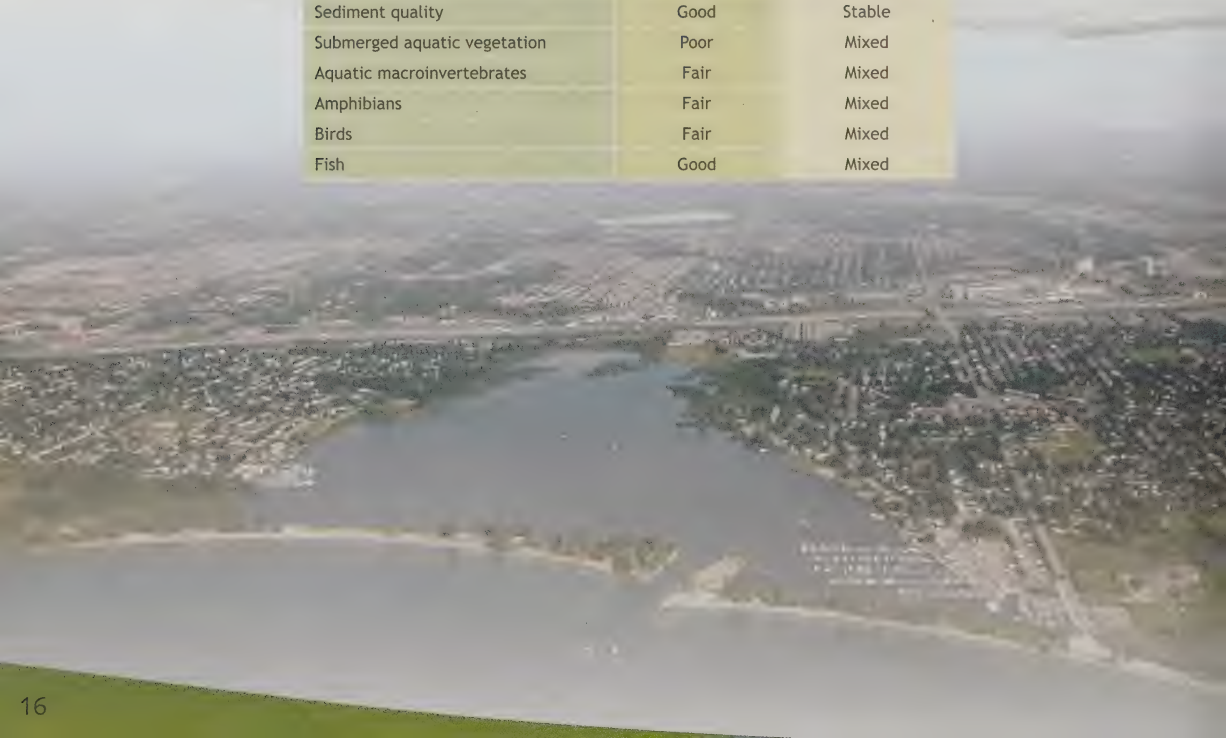


Frenchman's Bay Marsh

Benthic organisms live in or on the underwater sediments. Exposure to sediment-bound contaminants can result in toxicity and bioaccumulation of certain compounds. Despite being rated as good, Frenchman's Bay Marsh and its tributaries had some of the lowest sediment-quality results of all the Durham Region coastal wetlands. Relict pesticides and by-products (DDT and DDD), five PAHs, anthracene, cadmium, copper, zinc, chromium, and lead exceeded federal guidelines in several locations and years.

Wetland Statistics	
Location	City of Pickering
Wetland type	Barrier beach with permanent opening to Lake Ontario
Vegetation types	Marsh 99%, swamp 1%
Wetland size	39 hectares
Watershed size	1 652 hectares
Natural cover in watershed	31%

Report Card — Frenchman's Bay Marsh		
	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Good	Stable
Submerged aquatic vegetation	Poor	Mixed
Aquatic macroinvertebrates	Fair	Mixed
Amphibians	Fair	Mixed
Birds	Fair	Mixed
Fish	Good	Mixed





Hydro Marsh

The submerged aquatic vegetation and aquatic macroinvertebrate communities at Hydro Marsh averaged the lowest score of all Durham Region coastal wetlands. Only four species of submerged aquatic vegetation were found over the study period, none of which were turbidity-intolerant, though all were native. Among all Durham Region coastal wetlands, Hydro Marsh had the lowest quality and percent cover of vegetation over the study period. The poor submerged aquatic vegetation community may be contributing to the poor aquatic macroinvertebrate community, as there may not be adequate habitat to meet its needs. Despite the poor conditions of these communities, the fish community at Hydro Marsh is good, likely due to the channel linking it with the neighbouring Frenchman's Bay Marsh.

Wetland Statistics	
Location	City of Pickering
Wetland type	Barrier beach
Vegetation types	Marsh 98%, swamp 2%
Wetland size	26 hectares
Watershed size	1 071 hectares
Natural cover in watershed	30%

Report Card – Hydro Marsh		
	Condition	Trend
Water quality	Fair	Stable
Sediment quality	Good	Stable
Submerged aquatic vegetation	Poor	Stable
Aquatic macroinvertebrates	Poor	Mixed
Amphibians	Fair	Mixed
Birds	Fair	Mixed
Fish	Good	Mixed



Duffins Creek Marsh

The Duffins Creek watershed is considered the healthiest in the Toronto and Region Conservation Authority's jurisdiction, with 37% natural cover and good overall forest cover throughout the watershed. Land use is primarily agricultural and, typical of most watersheds in southern Ontario, urbanization is concentrated in the southern portion of the watershed. Future growth and development is expected to occur in the watershed, particularly its middle reaches.

The Duffins Creek Marsh Restoration Plan, implemented by the Toronto and Region Conservation Authority, is aimed at improving habitat quality through wetland restoration, reforestation and management, meadow enhancement, creation of habitat features for fish and wildlife, and trail alignment. A water control structure was installed in a lagoon located in the northwest corner of the marsh, which is equipped with fish grates to prevent the passage of large Common Carp but allowing smaller fish. While feeding, carp suck in and expel water, mud and debris, thus uprooting plants, releasing nutrients and resuspending sediments. This increases water turbidity, which limits light penetration through the water column and can reduce aquatic plant growth. Since the installation of the water control structure, water quality at Duffins Creek Marsh has improved, driven largely by a decline in turbidity in the marsh.

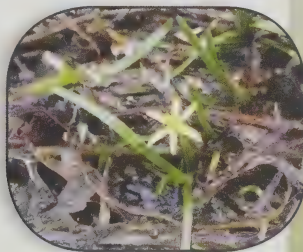
Wetland Statistics

Location	City of Pickering and Town of Ajax
Wetland type	Drowned river-mouth
Vegetation types	Marsh 88%
Wetland size	78 hectares
Watershed size	28 653 hectares
Natural cover in watershed	37%

Report Card — Duffins Creek Marsh

	Condition	Trend
Water quality	Fair	Improving
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Poor	Improving
Aquatic macroinvertebrates	Good	Mixed
Amphibians	Poor	Mixed
Birds	Good	Unknown
Fish	Fair	Mixed

As water quality improved over the study period, so did the condition of the submerged aquatic vegetation community, suggesting a link between the two. If water quality continues to improve in the marsh, it is possible that other biological communities will also improve.



Exotic Species Impacts on Coastal Wetlands

An exotic species is a plant or animal that has been introduced from another geographic region to an area outside its natural range. Once outside its natural range it is free from the natural predators, pathogens, parasites and competitors that once controlled its population. Free from these controls, many exotic species are capable of rapid population growth and will out-compete or prey upon native species. Aside from competition, this often leads to habitat degradation and loss as well as decreased biodiversity. Many exotic species have been identified in the Durham Region coastal wetlands. Those that have the most significant impacts on these ecosystems include the Mute Swan, the fishes Common Carp, Goldfish and Round Goby, and the plants Purple Loosestrife, Eurasian Watermilfoil, Curly Pondweed, and European Frogbit. The spread of many of these exotic species can be prevented by learning to identify them, removing bilge water as well as plants and animals from boats before leaving access points, disposing of unwanted live bait in the trash, and never dumping or re-locating plants or animals into natural areas.





Carruthers Creek Marsh

Biological communities in Carruthers Creek Marsh are showing signs that the poor water quality, with turbidity levels among the highest reported of all Durham Region coastal wetlands, is affecting wetland condition. No turbidity-intolerant submerged aquatic vegetation species were found, and overall species richness was low. The breeding marsh-bird community is in poor condition. No area-sensitive marsh-nesting obligates were observed at the marsh, suggesting inadequate areas of high-quality emergent marsh habitat for breeding. Wood Frogs, which were historically abundant in Carruthers Creek Marsh, were not found in 2007. However, the Northern Leopard Frog (a disturbance-intolerant species) was heard calling.

Wetland Statistics

Location	Town of Ajax
Wetland type	Drowned river-mouth
Vegetation types	Marsh 24%, swamp 76%
Wetland size	116 hectares
Watershed size	3 812 hectares
Natural cover in watershed	25%

Report Card — Carruthers Creek Marsh

	Condition	Trend
Water quality	Poor	Mixed
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Poor	Stable
Aquatic macroinvertebrates	Good	Mixed
Amphibians	Fair	Mixed
Birds	Poor	Mixed
Fish	Good	Mixed



Lynde Creek Marsh

Lynde Creek Marsh supports one of the best fish communities in the region, with higher numbers of native species including sunfish, a higher percentage of piscivores, and a lower percentage of non-native fish. Although it is one of the best coastal wetlands in Durham Region for fish, other Lake Ontario coastal wetlands, notably the Bay of Quinte, consistently support far richer fish communities.

The Central Lake Ontario Conservation Authority (CLOCA) has developed the *Lynde Creek Watershed Existing Conditions Report* as the first phase in the Lynde Creek Watershed Plan. When it is finalized, the plan will be used to develop specific strategies to maintain, improve, and restore coastal wetland and watershed integrity. These strategies will direct key ecosystem considerations into land-use planning, decision-making, and stewardship initiatives. In addition, CLOCA's acquisition of land adjacent to the marsh is helping to conserve natural cover in the watershed, an essential element in restoring wetland integrity.

Wetland Statistics

Location	Town of Whitby
Wetland type	Drowned river-mouth and barrier beach
Vegetation types	Marsh 58%, swamp 42%
Wetland size	157 hectares
Watershed size	13 098 hectares
Natural cover in watershed	30%

Report Card — Lynde Creek Marsh

	Condition	Trend
Water quality	Fair	Stable
Sediment quality	Very Good	Stable
Submerged aquatic vegetation	Poor	Stable
Aquatic macroinvertebrates	Fair	Mixed
Amphibians	Fair	Mixed
Birds	Good	Stable
Fish	Good	Mixed

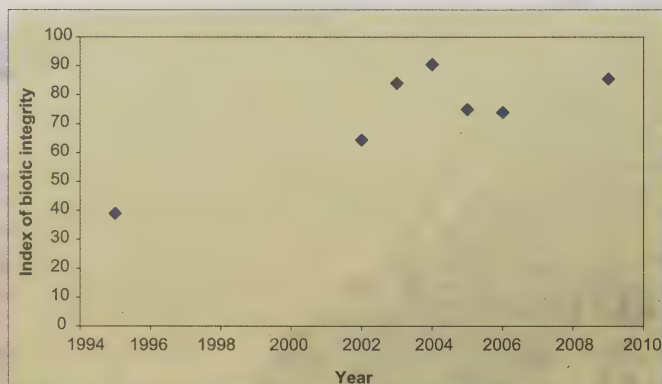
The American Coot was one of the area-sensitive marsh-nesting obligates observed at Cranberry Marsh.



Cranberry Marsh

The effects of watershed land use on coastal wetlands can often depend on the wetland's linkages to the Great Lakes. Cranberry Marsh is generally isolated from lake water influence because of its barrier beach. These isolated types of coastal wetlands are more influenced by watershed development than wetlands connected to the lake. While Cranberry Marsh's watershed is small, it may have a sizeable impact on wetland condition. Conservation actions including adjacent land management will likely have a substantial effect on wetland condition. A 36-hectare parcel adjacent to the marsh was acquired and has been converted from agricultural production into natural cover (currently a meadow). In addition a 60-hectare parcel that includes the nearby Lynde Creek Marsh has been taken out of crop production and will further augment the natural cover surrounding both Lynde Creek and Cranberry marshes.

These conservation actions may already be having an impact on the condition of the marsh; in 2009, Cranberry Marsh had the highest water-quality score of all the Durham wetlands since 2002. The biotic communities are also showing positive signs, as the condition of the aquatic macroinvertebrate community also improved. While the condition of the submerged aquatic vegetation community was fair, there is abundant emergent and woody vegetation established around the marsh. This vegetation contributes to habitat value, which is reflected in the bird community of Cranberry Marsh, the best of all the Durham Region coastal wetlands surveyed. Cranberry Marsh had the highest abundance of area-sensitive marsh-nesting obligates and marsh-nesting obligates. As part of a restoration management plan, in 2001, water levels in Cranberry Marsh were drawn down. A comparison with data from the mid-1990s suggests there was a marked improvement in the bird community's condition following the drawdown (see figure). While allowing coastal wetlands to function naturally is often ideal, in certain situations, management actions such as drawdowns can have a positive effect on wetland ecosystems.



The condition of the bird community at Cranberry Marsh improved dramatically following restoration measures.



Wetland Statistics

Location	Town of Whitby
Wetland type	Barrier beach
Vegetation types	Marsh 75%, swamp 25%
Wetland size	43 hectares
Watershed size	166 hectares
Natural cover in watershed	57%

Report Card – Cranberry Marsh

	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Fair	Mixed
Aquatic macroinvertebrates	Good	Improving
Amphibians	Fair	Mixed
Birds	Very Good	Mixed
Fish	Fish sampling not conducted due to low water levels.	



The only occurrence of a Common Nighthawk during the project was reported at Corbett Creek Marsh in 2006. The Common Nighthawk is federally listed as a species at risk.



Corbett Creek Marsh

Great Lakes coastal wetlands are unique because they are influenced by large lake processes. Water levels can fluctuate over short periods of time due to lake **seiches** and closures at the outlet of a wetland to the lake. For wetlands like Corbett Creek Marsh that periodically close off from the lake, water levels may differ from Lake Ontario by up to one metre.

Seiche

A standing wave that moves back and forth across an enclosed water body. In Lake Ontario, as the wave moves across the lake, local rises and falls in water levels are experienced. The standing wave is generally caused by strong winds that blow water toward one end of the lake. When the wind eases, the standing wave begins to move back to the other side of the lake, initiating the oscillation.

The aquatic macroinvertebrate community appears to be responding to the recent improvement in water quality; however, the reason for this improvement is unclear at this time and requires further monitoring.

Wetland Statistics	
Location	Town of Whitby
Wetland type	Drowned river-mouth and barrier beach
Vegetation types	Marsh 76%, swamp 24%
Wetland size	28 hectares
Watershed size	1 463 hectares
Natural cover in watershed	27%

Report Card – Corbett Creek Marsh		
	Condition	Trend
Water quality	Fair	Improving
Sediment quality	Good	Stable
Submerged aquatic vegetation	Fair	Mixed
Aquatic macroinvertebrates	Good	Improving
Amphibians	Poor	Mixed
Birds	Good	Mixed
Fish	Fair	Mixed

The regionally rare Swamp Loosestrife provides important habitat for many marsh bird species.



Pumphouse Marsh

Pumphouse Marsh is one of the smallest coastal wetlands in Durham Region and has the smallest watershed. Inputs of water to the marsh come almost entirely from storm sewers that flow from the densely urbanized land surrounding the marsh; lake inflows are limited to seepage through the well-established barrier beach. Storm sewer-fed wetlands may be more affected by surrounding land-use practices that impact water and sediment quality and degrade habitat. High levels of metals and PAHs, possibly originating from automobile grease and oil washed into the sewers following storm events, were consistently found in sediment, particularly near inlets to the marsh.

The condition of the fish community was largely influenced by a population of goldfish, a non-native species likely introduced to the marsh from pet stock. Perceived as harmless, goldfish prey upon the eggs, larvae and adults of native fishes, increase turbidity, and feed on aquatic vegetation. In 2006, goldfish made up half of the fish sampled in Pumphouse Marsh.

Wood Frogs were the only woodland species found in the marsh. While the land adjacent to Pumphouse Marsh is primarily residential, there is adequate forest cover for this species to hibernate, travel to the marsh, breed, and return to forested areas to overwinter. The protection of corridors linking wetlands to forested areas is vital to the success of woodland species (see sidebar).

Importance of Naturally Vegetated Upland Areas Beside Wetlands

- Provide habitat for wildlife during part of their life cycle
- Provide foraging areas for wildlife
- Act as corridors so wildlife can travel between wetlands and uplands
- Provide a physical buffer between human-use areas and wetlands
- Improve water quality by reducing sediment, contaminants, and nutrient loading
- Reduce erosion
- Increase water recharge areas

Wetland Statistics

Location	City of Oshawa
Wetland type	Barrier beach
Vegetation types	Marsh 78%, swamp 22%
Wetland size	7 hectares
Watershed size	55 hectares
Natural cover in watershed	23%

Report Card – Pumphouse Marsh

	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Fair	Improving
Submerged aquatic vegetation	Fair	Mixed
Aquatic macroinvertebrates	Good	Mixed
Amphibians	Fair	Mixed
Birds	Fair	Mixed
Fish	Fair	Stable



Oshawa Second Marsh

Oshawa Second Marsh has been the target of significant restoration activities since 2001 when Ducks Unlimited Canada, in partnership with Environment Canada, the City of Oshawa, Central Lake Ontario Conservation Authority, and Friends of Second Marsh, implemented a major project to improve its condition. A dike was created along Harmony Creek to keep the sediment- and nutrient-laden creek water and large Common Carp from directly entering the marsh. Along the dike, a grated fish passageway with a water-control structure was constructed. The structure allows water in or out of the marsh as required and limits Common Carp from entering the marsh to spawn, while still allowing native fish to enter and exit. Oshawa Second Marsh averaged the best submerged aquatic vegetation community over the study period, as it had relatively high abundance and high percentage of turbidity-intolerant species, as well as higher percent cover and floristic quality.

Wetland Statistics	
Location	City of Oshawa
Wetland type	Barrier beach
Vegetation types	Marsh 69%, swamp 31%
Wetland size	133 hectares
Watershed size	10 705 hectares
Natural cover in watershed	24%

Report Card — Oshawa Second Marsh		
	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Fair	Stable
Submerged aquatic vegetation	Good	Mixed
Aquatic macroinvertebrates	Good	Stable
Amphibians	Fair	Stable
Birds	Very Good	Mixed
Fish	Fair	Stable



McLaughlin Bay Marsh

McLaughlin Bay Marsh supports relatively little emergent vegetation habitat for birds, but it is flanked by Oshawa Second Marsh to the west and surrounded by Darlington Provincial Park to the north and east. The surrounding natural land has allowed the wetland to support one of the highest-ranked breeding bird communities in Durham Region coastal wetlands. In 2005, there was a high abundance of area-sensitive marsh-nesting obligates, including Black Tern, a provincially recognized species of special concern. While the bird community is in very good condition, the fish community's condition is deteriorating. McLaughlin Bay Marsh saw its highest fish community score in 2005, when the barrier beach, which is generally closed throughout the year, blew open for one to two months, allowing fish passage between the lake and marsh. This suggests that a periodic connection to the lake may benefit the fish community at this site.

Wetland Statistics

Location	City of Oshawa and Municipality of Clarington
Wetland type	Barrier beach
Vegetation types	Marsh 86%, swamp 14%
Wetland size	44 hectares
Watershed size	209 hectares
Natural cover in watershed	69%

Report Card — McLaughlin Bay Marsh

	Condition	Trend
Water quality	Poor	Stable
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Poor	Stable
Aquatic macroinvertebrates	Fair	Mixed
Amphibians	Fair	Mixed
Birds	Very Good	Mixed
Fish	Fair	Deteriorating



Westside Marsh

Westside Marsh includes a remnant fen, the only one in the Durham Region coastal wetlands. Fens, rare in the lower Great Lakes, are highly susceptible to changes in nutrient and water inputs, making them difficult to rehabilitate once disturbed. The best management is to protect them by securing their water sources and not altering watersheds where they occur.

Westside Marsh recently underwent substantial alteration due to the expansion of the adjacent limestone quarry, reducing the wetland area by 30%. Restoration measures have been taken at the marsh, which may account for the improving aquatic macroinvertebrate community, the increase in Yellow Perch and the decreasing turbidity.

The condition of the bird community at Westside Marsh over the study period was good, influenced by the marsh-nesting obligate species observed, mainly Virginia Rails. Virginia Rails have been heard calling at the wetland despite the habitat alterations. Though they do not generally breed in disturbed habitat, Virginia Rails tend to be loyal to breeding location. It is unlikely that this phenomenon will sustain the population if other habitat conditions (e.g., water quality and submerged aquatic vegetation conditions) do not improve.

Wetland Statistics	
Location	Municipality of Clarington
Wetland type	Barrier beach
Vegetation types	Marsh 86%, swamp 13%, fen 1%
Wetland size	31 hectares
Watershed size	549 hectares
Natural cover in watershed	28%

Report Card – Westside Marsh		
	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Poor	Mixed
Aquatic macroinvertebrates	Good	Improving
Amphibians	Poor	Stable
Birds	Good	Improving
Fish	Poor	Mixed



Bowmanville Marsh

Numerous bird species were found in Bowmanville Marsh, although few marsh-nesting obligate species were observed. The scarcity of marsh-nesting obligate species, and particularly of area-sensitive species, suggests that suitable marsh breeding habitat is lacking.

The fish community at the marsh has generally been in good condition throughout the project. Although the marsh experiences periods of high turbidity, there are often good numbers of turbidity-intolerant species caught during sampling. During periods of poor water quality, it is possible that fish find refuge in the less-disturbed backwaters of the wetland or exit via the permanent connection to the lake.

Water quality at Bowmanville Marsh improved while submerged aquatic vegetation community condition decreased—which is not expected given the link between these two attributes. Continued monitoring of this marsh is required to understand these trends.

Wetland Statistics

Location	Municipality of Clarington
Wetland type	Drowned river-mouth
Vegetation types	Marsh 92%, swamp 8%
Wetland size	33 hectares
Watershed size	16 590 hectares
Natural cover in watershed	36%

Report Card — Bowmanville Marsh

	Condition	Trend
Water quality	Fair	Improving
Sediment quality	Very Good	Stable
Submerged aquatic vegetation	Poor	Deteriorating
Aquatic macroinvertebrates	Fair	Mixed
Amphibians	Poor	Mixed
Birds	Fair	Mixed
Fish	Good	Mixed



Wilmot Creek Marsh

The Wilmot Creek watershed is best known for its coldwater fisheries that support a variety of salmon and trout species. Many of these species are found in the wetland during the late-summer fish sampling period, but these fish are generally on their way to the upper reaches of the watershed. However, there is also a resident fish community more typical of coastal wetlands. Northern Pike are generally caught during surveying, and other piscivores such as Bowfin and Largemouth Bass are also supported in the marsh. Overall, Wilmot Creek Marsh had the best fish-community condition of all the Durham Region coastal wetlands. It also had the best amphibian-community condition, though the condition of the invertebrate community at this marsh is declining.

Wetland Statistics	
Location	Municipality of Clarington
Wetland type	Drowned river-mouth and barrier beach
Vegetation types	Marsh 71%, swamp 29%
Wetland size	27 hectares
Watershed size	9 882 hectares
Natural cover in watershed	37%

Report Card – Wilmot Creek Marsh		
	Condition	Trend
Water quality	Fair	Stable
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Fair	Mixed
Aquatic macroinvertebrates	Good	Deteriorating
Amphibians	Fair	Mixed
Birds	Fair	Mixed
Fish	Good	Mixed



Port Newcastle Marsh

Port Newcastle Marsh is the easternmost coastal wetland in Durham Region. Though its watershed is moderate in size, the wetland is the third smallest in the study. At 44%, natural cover in the watershed is high, dominating land-use types such as agriculture and urban. The marsh is flanked by residential development and has a marina at its southern end.

While still moderately degraded, Port Newcastle Marsh is among the Durham Region coastal wetlands with the highest water quality. Moderate turbidity levels, favourable pH, low water temperature and low nutrient concentrations contribute to the better water quality found here. Furthermore, conductivity has decreased over the study period.

The average condition of the submerged aquatic plant community, which was among the best in the Durham Region coastal wetlands during the first year of sampling, was poor over the study period. Declines in native species richness and percent coverage within the wetland are likely contributing to this condition. Turbidity-intolerant species, including Flat-stemmed Pondweed and Tape Grass, were found, but not in all years. This wetland is fairly shallow, so late-season low water levels in the lake may be partially at play. Notably, Floating Arrowhead was among the native species found here; this plant is not generally found in Durham Region coastal wetlands.

Conditions are not ideal for breeding marsh birds in Port Newcastle Marsh because of the small area of emergent marsh habitat. No area-sensitive marsh-nesting obligate species were found during surveys, though non-aerial foragers were relatively abundant, including Song Sparrow, Swamp Sparrow, Yellow Warbler, and Red-winged Blackbird.

Wetland Statistics

Location	Municipality of Clarington
Wetland type	Drowned river-mouth
Vegetation types	Marsh 52%, swamp 48%
Wetland size	11 hectares
Watershed size	7 814 hectares
Natural cover in watershed	44%

Report Card — Port Newcastle Marsh

	Condition	Trend
Water quality	Fair	Mixed
Sediment quality	Excellent	Stable
Submerged aquatic vegetation	Poor	Mixed
Aquatic macroinvertebrates	Fair	Mixed
Amphibians	Poor	Mixed
Birds	Fair	Mixed
Fish	Good	Mixed

Additional Study Sites Within Durham Region

The Ontario Ministry of Natural Resources recently completed wetland evaluations which resulted in three additional coastal wetlands being designated as Provincially Significant Wetlands: Whitby Harbour Wetland Complex, Gold Point Coastal Wetland, and Oshawa Creek Coastal Wetland. In recognition of these new designations, the DRCWMP began taking steps in 2007 to extend the DRCWMP framework to include monitoring the marsh habitats within these wetlands. Preliminary results are shown below.

	Whitby Harbour Marsh	Gold Point Marsh	Oshawa Creek Marsh
Location	Town of Whitby	City of Oshawa	City of Oshawa
Wetland type	Barrier beach	Drowned river-mouth with barrier beach	Drowned river-mouth with barrier beach
Vegetation types	Marsh 76% Swamp 24%	Marsh 65% Swamp 35%	Marsh 41% Swamp 59%
Wetland size	8 hectares	4 hectares	20 hectares
Watershed size	2 847 hectares	294 hectares	12 048 hectares
Natural cover in watershed	19%	11%	24%
Water quality	Fair	Poor	Fair
Submerged aquatic vegetation	Fair	Data not collected	Poor
Aquatic macroinvertebrates	Fair	Good	Fair
Amphibians	Data not collected	Fair	Poor
Birds	Data not collected	Poor	Fair
Fish	Good	Data not collected	Good



Looking Back

Overview

The water quality at individual Durham Region coastal wetlands was degraded which, in general, negatively affects the condition of submerged aquatic plant communities. This has contributed to poor conditions in bird, fish, and amphibian communities by limiting quality habitat for foraging, breeding, and shelter. Indicator species such as turbidity-intolerant vegetation, Yellow Perch, piscivorous fish, woodland amphibians, and area-sensitive marsh-nesting obligate birds are largely absent.

While these poor conditions are discouraging, restoration at individual wetlands is driving an overall regional improvement in water quality and in the condition of aquatic macroinvertebrate communities.

Some Biological Communities Are in Good Condition

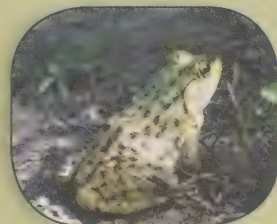
While conditions in other Lake Ontario wetlands are generally better, some biological communities in the Durham Region coastal wetlands are doing well nonetheless.

Good Condition:

- Submerged aquatic plant community at Oshawa Second Marsh
- Aquatic macroinvertebrate communities at Rouge River, Duffins Creek, Carruthers Creek, Cranberry, Corbett Creek, Oshawa Second, Pumphouse, Westside and Wilmot Creek marshes
- Breeding bird communities at Rouge River, Frenchman's Bay, Duffins Creek, Lynde Creek and Corbett Creek marshes
- Fish communities at Frenchman's Bay, Hydro, Carruthers Creek, Lynde Creek, Bowmanville, Port Newcastle, and Wilmot Creek marshes

Very Good Condition:

- Breeding bird communities at Cranberry, Oshawa Second, McLaughlin Bay and Westside marshes





Value of Restoration

- Better habitat for biological communities
- Improved recreational opportunities
- Opportunity to link biological communities by acting as a source population to colonize other wetlands

Restoration

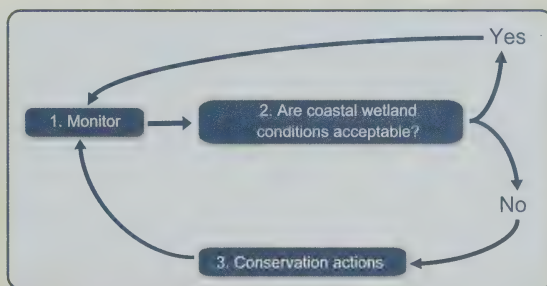
Restoration work has been ongoing at Cranberry, Rouge River, Duffins Creek and Oshawa Second marshes. The water quality and the condition of submerged aquatic plant communities have improved at Rouge River and Duffins Creek marshes, as has the aquatic macroinvertebrate community at Cranberry Marsh. From 2002 to 2007, the condition of the submerged aquatic vegetation community, as well as the water quality, improved significantly at Oshawa Second Marsh. These improvements demonstrate the positive effect of restoration actions on wetland condition.

Other Lake Ontario Coastal Wetlands

Durham Region coastal wetlands were studied in the context of 15 other Lake Ontario coastal wetlands in the Bay of Quinte. These reference wetlands were in better overall condition: they generally had better water quality, more diverse biological communities, especially submerged aquatic vegetation and amphibians, higher species richness and abundance, fewer non-native species, and more indicator species.

Monitoring Is a Key Piece of the Puzzle

The Durham Region coastal wetlands have been dramatically affected by numerous human-induced stressors, notably related to land development in the watershed and surrounding lands. Monitoring and reporting on the condition of Durham Region coastal wetlands are required as the first step in the restoration process. Monitoring alone will not improve the condition of the wetlands. Without restoration, the DRCWMP will simply monitor the demise of the region's coastal wetlands. Conservation actions need to be taken.



A simple restoration cycle involves determining if coastal wetland conditions are acceptable. If they are, then monitoring is required to ensure that conditions do not fall below acceptable limits. If conditions are not acceptable, then the wetland and/or its watershed require conservation actions. The site continues to be monitored to determine if conditions have been restored and improved.

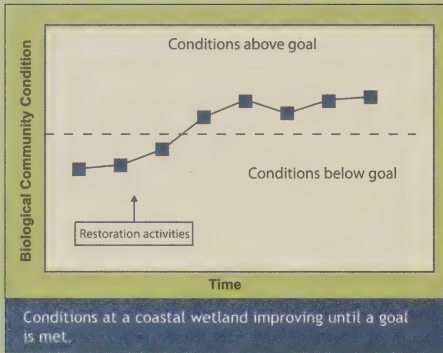
Within Durham Region, conservation actions have already begun to have positive effects at some sites. Continuing these efforts in wetlands and across watersheds will build a brighter future for the Durham Region coastal wetlands, the fish and wildlife that rely on them, and the functions and values that they provide (see also on page 4, **Who Needs Wetlands?**).



How to Determine if Conditions Are Acceptable

What to do about the condition of wildlife communities and habitats in the Durham Region coastal wetlands is ultimately a public decision. Setting goals for acceptable coastal wetland conditions can be difficult. However, comparisons to similar environments can be worthwhile. For example, a sound understanding of the condition of bird communities at other comparable Lake Ontario coastal wetlands can be useful to show what is possible and to help stakeholders set goals for their own coastal wetland bird communities.

Regional goals can also include other aspects monitored through the DRCWMP such as natural cover in the watershed, water quality and the condition of submerged aquatic plant communities. Such goals can be part of natural heritage strategies and plans, restoration plans and other planning documents, or even act as targets for community groups, agencies and individuals to work towards.





What Can Be Done to Improve Wetland Condition?

As Individuals:

- Watch what goes down the drain, runs off properties, and is placed in streams and wetlands
 - Use toxic substance drop-off centres;
 - Don't put plants or animals into waterways; and
 - Divert driveway and roof runoff from directly entering storm sewers.
- Get involved in stewardship—start or join a naturalist club.

As a Community:

- Strive to meet recommended environmental guidelines for streams, watersheds and water quality.

Examples of guidelines for improving wetland condition

- Streams
 - Minimum 30 m of natural vegetation on each side
 - Minimum 75% of banks naturally vegetated
- Wetland cover in watershed
 - Minimum 10%
- Forest cover in watershed
 - Minimum 30%
- Water quality
 - Minimum: meet the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines*

* See www.ccme.ca for more information.

Few places remain with concentrations of freshwater coastal wetlands such as are found in Durham Region. Challenges lie ahead, but with them come opportunities to claim the Durham Region coastal wetlands as a natural success story. There are already many examples—Rouge River, Duffins Creek and Oshawa Second marshes—that show it is possible. The foundation for success will be community commitment to conservation and ongoing monitoring through the Durham Region Coastal Wetland Monitoring Project.



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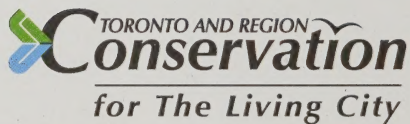
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